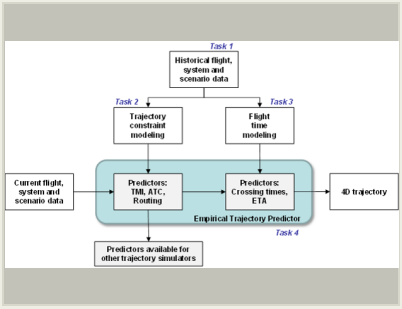
Probabilistic Trajectory Constraint Modeler, Phase I

Completed Technology Project (2015 - 2015)

Project Introduction

Air traffic control research, air traffic control operations and user operations rely on simulators that predict the future time history of three-dimensional aircraft trajectories. Such predicted trajectories are fundamental inputs to a wide variety of planning, monitoring and control tasks, including airline seasonal fleet planning, pre-departure flight planning, real-time airspace and airport load forecasting, traffic sequencing and spacing, separation assurance, weather routing, runway assignment, etc. Clearly trajectory simulators are core components of many air traffic applications; it is important that they be as accurate, as efficient and as manageable as possible. We propose an innovative trajectory constraint modeling utility that leads to improvements in all three areas. Regarding trajectory simulator accuracy, there are several categories of error sources that contribute to trajectory prediction uncertainty. One key, and overlooked, source is flight plan nonconformance. Flights often fail to follow their flight plan due to various constraints that are encountered, such as altitude holding, speed control, path stretching and reroutes. It is important to model these constraints both for flight time forecasting as well as load forecasting. Such constraints are not deterministic and their variance is a major contributor to trajectory prediction error. Therefore our constraint modeler produces probabilistic constraint forecasts which, in turn, support probabilistic trajectory prediction. Advanced air traffic applications not only require trajectory predictions that (i) are as accurate as possible, but also that (ii) provide an indication of their error as well, which can vary substantially. Traditionally, predictors have produced deterministic trajectories and their uncertainty is often ignored. We also discuss in our proposal how our trajectory constraint modeler supports significant improvements in efficiency and manageability of trajectory predictors.



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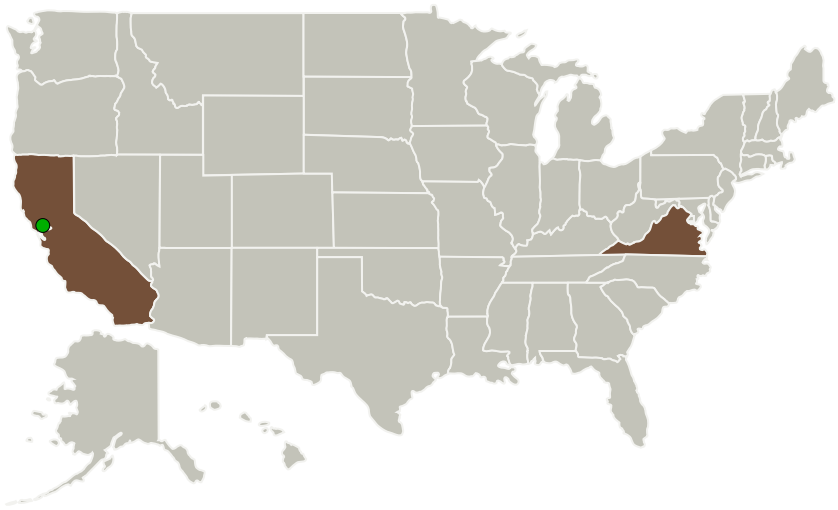
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Mosaic ATM, Inc.	Lead Organization	Industry	Leesburg, Virginia
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Virginia

Project Transitions

June 2015: Project Start

December 2015: Closed out

Closeout Summary: Probabilistic Trajectory Constraint Modeler, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/139350)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Mosaic ATM, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

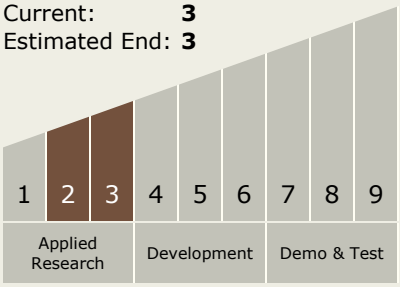
Carlos Torrez

Principal Investigator:

George Hunter

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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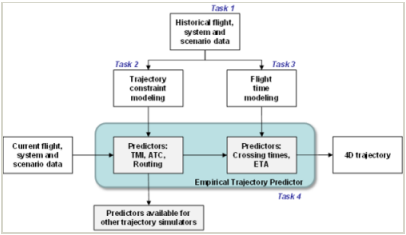
Images



Briefing Chart Image
Probabilistic Trajectory Constraint Modeler, Phase I
(https://techport.nasa.gov/image/136520)

Technology Areas

Primary:

- TX15 Flight Vehicle Systems
  - TX15.1 Aerosciences
    - TX15.1.6 Advanced Atmospheric Flight Vehicles

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System